G-4 NEWS

Volume 3 Issue 2 *The Newsletter for Oxygen Compatibility Practitioners* Fall 1996

Second ISP Proposal Begun for Metals at High Temps

Fund commitments for the Committee's first Industry Sponsored Program (ISP) to test thick-section stainless steels stand at more than $80,000, and the testing is about to begin. The second ISP is being drafted by Joe Slusser of Air Products and Chemicals, Inc., who has agreed to lead this effort. This program will be to measure the effect of temperature on the flammability of metals of interest to burgeoning new oxygen-processes at high temperatures.

The first ISP should be complete in FY 97. If funding is obtained, the second program could begin in late FY 97 but will probably not finish until some time FY 98.

Progress at Seattle:

.....An Abundant Seminar Was Had!

Blossoming of the Seminar Series and the funding of G-4's first proposal to industry crowded the Committee's agenda. However, actions were taken on ballots of three standards including completion of the new incident study standard.

The ***G-4 Main*** Committee learned that Dwight Janoff, our new Secretary has taken a position with FKM Inc and will not be able to serve the balance of his term. G4 wishes Dwight well and expressed appreciation for the superb contributions he has made through the years. Ulrich Koch will replace him.

Steve Mawn presented Bill Royals with the ASTM Committee on Publications "Award for Excellence in Symposium and Publication Management" for STP 1267. Dwight Janoff and Mohan Gunaji share in the award but were not present to receive receive the citation.

The ***G4.01 Test Methods*** Subcommittee successfully balloted a precision and bias statement for G 122 on Evaluating Cleaning Effectiveness. The standard will be available soon.

A reballot of a test method to evaluate cleanliness by total carbon analysis also passed subcommittee ballot.

Round robin tests for G 72 on autogenous ignition temperature measurements remain elusive.

A rewrite of G 86 (pressurized mechanical impact) is underway to incorporate ambient- pressure LOX impact tests.

The ***G4.02 Practices*** first Task Force on Industry Sponsored Programs has confirmed sufficient donations to begin testing. A second proposal on metals at high temperature will be lead by Joseph Slusser

*(See **Progress** on page 2)*

Inside This Issue

1997 Symposium to Host 25 Papers

The Fall 1997 G-4 symposium to be held November 13-14, has received twenty-on abstracts. The titles of the papers expected are as follows:

"Analysis of Metals Combustion Through Power Production"

"Ignition Resistance of Hard (Type III) Anodized Aluminum to Particle Impact"

"Determining Water Suppression Rates for Fires in Oxygen-Enriched Atmospheres in Hypobaric Chambers"

"Liquid Oxygen Spills - The Time Dependence of Impact Sensitivity of Various Materials That Have Been Exposed to Liquid Oxygen"

"Influence of Alloying Additions on the Flammability of Nickel-Based Alloys in an Oxygen Environment"

"Pressure Effects on Ignitability in Gaseous Oxygen of Polymeric Materials Used in Air-Breathing Devices"

"Modeling of the NASA White Sands Test Facility Metals Frictional Ignition Test System"

"The Utilization of the Gordon McBride Computer Code Calculations for Metal Burning"

"A Model for the Burning of Teflon"

"Experimental Study of Flame-Spreading Processes Over Aluminum Foils"

"Flammable Intestinal Gas Mixture Created by Nitrous Oxide Anesthesia"

"Performance of Miniature Brazed Aluminum Heat Exchangers in Flammability Tests Involving Liquid Oxygen"

"Promoted Ignition-Combustion Behavior of AL6XN and AISI 347 Austenitic Stainless Steels in Oxygen-Enriched Atmospheres"

"A Materials Compatibility Database for Metallic and Non-Metallic Materials Com-

(See Symposium on page 3)

Fall Seminar Series Papers

At this Fall '96 meeting, seven papers were offered. Four of these papers are being peer reviewed for inclusion in Special Technical Publication (STP) 1319. Authors are allowed to provide limited copies (after peer review) to others upon their moral obligation to purchase the STP when it becomes available. Abstracts for these papers (edited by ***G-4 News*** for space) are:

Wilson, D., B., and Stoltzfus, J., **"A Model of Promoted Combustion Burning: Iron"**

The promoted combustion test ranks metals and alloys with respect to flammability. It measures the threshold pressure of metals and alloys and the regression rate of the melting interface of the rod. Recently a series of experiments was conducted for iron in which surface temperatures of the molten drop at various stages of gravity, detachments, and drop were measured.

Iron burned at the conditions examined, in completely heterogenous reactions; that is, all products and reactants were condensed phase. A simple first-order, lumped-parameter model was developed for the standard promoted combustion burn. The accumulated experimental data for iron was used to validate the model. Kinetic and mass transfer parameters were obtained.

Wilson, D. B., and Stoltzfus, J., **"Fundamentals of Metals Ignition in Oxygen"**

One of the prominent approaches to ignition modeling of metals is based on the concept that there are multiple steady-state solutions to lumped parameter models' mass and energy balances. Some of these solutions are stable, and some are unstable. Ignition is associated with a system originating at an unstable steady state and, under forcing, the movement of the model solution to a new steady state is termed "ignition." The applicability of this approach is evaluated for each of the modes of metal ignition in oxygen-enriched atmospheres that has been identified as an industrial and aerospace application.

The ignition modes identified are: promoted combustion, particle impact, and friction. The concept is shown to be consistent for promoted combustion. However, the other two modes of ignition are associated with the initial condition (particle impact) and boundary condition (friction). Therefore, these instabilities are not so readily attributed to steady states.

Wilson, D. B., and Stoltzfus, J., **"A Model of Promoted Combustion Burning: Aluminum"**

The promoted combustion test is used for selection of materials for oxygen-enriched atmospheres. Weight-strength characteristics are important for aerospace applications, and aluminum and its alloys become attractive materials. However, the low threshold pressure of aluminum (0.145 MPA) requires that alloying occur or coatings are used before aluminum is acceptable for most applications. To better interpret the effects of these modifications on the flammability of aluminum, a model of promoted combustion was developed.

The model is a simple, first-order, lumped-parameter mathematical description involving the appropriate mass and energy balances. The model incorporates product volatility and allows for diluents in the gas phase. The latter system has been shown to significantly change the threshold pressure. Appropriate kinetic and mass transfer parameters are obtained from the validated model.

Castillo, D. G., and Werley, B. L., **"Eliminating Bypass Valves in Selected Oxygen Systems"**

ABSTRACT: CGA Pamphlet G-4.4 recommends bypass valves around isolation valves "where required to minimize adiabatic compression or particle impingement." Bypass valves add cost and can be vulnerable components. Strategies for eliminating the need to

*(See **Seminar** on page 3)*

*(**Progress** continued from page 1)*

(see lead article, p.1).

Tin Chou replaces Ken McIlroy as Chairman of G4.02.

A second concurrent ballot of a standard on techniques and analyses that have been useful in studying causes of oxygen incidents was also successful, and the standard will also publish shortly as G 145.

The ***G4.05 Education*** subcommittee hosted seven papers as part of its Seminar Series (See ***Seminar*** article, page 2). The papers will be published with the papers of the next symposium in 1997.

A Technical and Professional Training (TPT) course held in conjunction with the meetings contained 30 students. The first-ever course in Australia had a total student attendance of 22.

The Advanced TPT Course Task Force is progressing slowly.

The Committee's computer utilities disk has become dated. Further, the number and size of the files have increased to where a single disk cannot contain them all. As a result, an second disk (Utilities II) was prepared to upgrade the files installed by the first disk and to add new materials, as they become available. This disk, as well as the first disk, will be given to all future TPT students.

The **G4.06 Symposium** subcommittee reported that there are twenty-five abstracts received for the 1997 G-4 International Symposium. In addition, the associated STP will contain as many as fourteen? papers given at seminar sessions.

Barry Newton was appointed chair of a new subcommittee ***G4.93 on Statistics and Data Handling***. **G4N**

G-4 Web Site

The G-4 Home Page has been going through changes recently. Our Webmaster Dwight Janoff has changed positions, and the file has moved to a new address at the NASA White Sands Test Facility (WSTF).

Our new Webmaster is Traci Ewing at WSTF. At present, the file is part of the WSTF home page and the address is ***www.wstf.nasa.gov/labs/oxcompat/***. After logging onto the WSTF page, you will need to go to the "Current Projects" folder and click on "Oxygen Compatibility." Since further changes may occur, if you encounter problems, our Webmaster's phone number is (505) 524-5299.

G4N

G-4 PC Utilities Disk Revision

The PC computer utilities disk that was given to all *G4 News* subscribers (one time) and TPT course attendees in recent years is being revised.

At the Spring 1996 G-4 meeting, a second addenda disk had been agreed upon to revise three utilities that had changed.

However, a study of the first disk content found not only that it was full, but that more than 60% of the 'usable" space was devoted to just one utility—the database of oxygen compatibility practitioners. Unfortunately, this is the most frequently modified and apparently least used of the utilities. It occupies 60% of the available space.

As a result, **G-4 People** and its support files will be removed and the remaining files will be updated. This new **Disk II** will replace the old disk for all TPT courses. As further revisions of the remaining content are made, **Disk II** will have its revision number incremented. The new space should accommodate two anticipated expansions of **G4Math** and one expansion of **G4 Ref11** (the bibliographic list of references) in the next several years.

The revised **G4 People** (which now includes E-Mail addresses) will still be available to those few people who use it by downloading from the G4 WebSite, and the prospect of making it searchable on the site will be explored, as will be E-Mailed revisions of the database file itself.

This latter prospect may require encryption to ensure against viruses, however, everyone should scan any downloads with an antivirus program.

Similarly, **Disk II** will shortly be available on the Web Site. There will be no mass mailing, but several copies will be circulated to those who requested them at the meeting (hoping they will be placed on Corporate LANs for downloading and otherwise distributed). Perhaps, ASTM TPT can also make it available at cost.

Disk II will contain the **G4Ref11** file which increases the number of bibliographic reference citations from 236 to more than 800 (and expected to break 1000 on the next revision) and the new **G4Math.EXE** computation utility which adds a screen for calculating Distance/Volume pieces (with at least two more screens under development). **G4N**

*(**Seminar** from page 2)*

provide bypass valves are reviewed based upon an interpretation of the intent of bypass valves and the thesis that an isolation valve should be operated either without differential pressure or with minimal differential pressure.

Schmidt, L. J., **"An Investigation into the Causes of the Flash Fire Involving Two Aluminum Cryogenic Valves in an Operating Air Separation Plant"**

Abstract: A flash fire occurred in two valves of an ASU following the closure of one. A liquid oxygen spill resulted that caused significant cold box damage. A flammable citrus-related cleaning agent found in the valves is the suspected initial promoter of the fire.

Schmidt, L. J., **"Suspected Hydrocarbon Detonation Causes Rupture of the Liquid Oxygen Piping to a Cryogenic Storage Vessel"**

Abstract: A explosion fragmented sections of external and internal piping of a liquid oxygen storage tank. A field modification had allowed liquid containing hydrocarbon to flow into the internal piping where the contaminant could concentrate through evaporation of the oxygen. The explosion is surmised too have occurred when the hydrocarbon concentrated into the explosive region.

Bryan, C. J., **"LOX/Asphalt Hazard,"**

Abstract: Reported incidents of accidents involving asphalt and LOX are reviewed. A discussion of a KSC test scenario for selection of the Space Shuttle runway material will be presented. **G4N**

*(**Symposium** from page 1)*

monly Utilized in Oxygen Service"

"A 6500 psig Gaseous Oxygen Impact Test System for Materials and Components Compatibility Evaluations"

"Materials in the Seal Configuration Test Apparatus"

Relative Performance of Elastomeric Materials in the Seal Configuration Test Apparatus"

"Variability in Oxygen Compatibility of FKM Elastomers"

"Inclusion of Oxygen Equipment Training in Workplace Basic First Aid Curricula"

"Ultrasonic Measurement of the Consumption Rate of Burning Metal Rods"

"Combustion Testing of Metallic Materials Aboard the NASA Johnson Space Center's KC-135"

"Combustion Testing of Non-Metallic Materials in Oxygen Enriched Atmospheres"

"Oil Migration on the Structured Packing by Evaporation and Recondensation During the Defrosting Operation in the Air Separation Unit"

"Oxygen Compatibility of Polymers Including PTFE, Kel-F 81, Vespel SP-21, Viton A, Viton A-500, Fluorel, Neoprene, EPDM, Buna N, and Nylon 6.6"

"An Ultra-High Pressure Vessel at BOC/GTC for Autoignition Study of Engineering Materials in Oxygen"

G4N

I want G-4 News!

Your name will be listed in our publicly available database of oxygen compatibility enthusiasts, please check ***all*** boxes that apply to you.

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Inside This Issue:

G-4 Events and Housekeeping

Regular meetings of the Committee G-4 have been scheduled as follows:
Mar 18-20, 1997.....St. Louis, MO
Nov 11-12, 1997.....San Diego, CA
Apr 22-24, 1998 .....Atlanta, GA
Sept 23-25, 1998.....Cocoa Beach, FL
Mar 17-19, 1999.....Seattle, WA-
Contact Steve Mawn (610) 832-9726 for details or membership data. ASTM Membership is $65 per year.

The next G-4 Symposium is on:
Nov 13-14, 1997.....San Diego, CA
For a Call for Papers or Program, call Steve Mawn (610) 832-9726.

Public offerings of the course: *Controlling Fire Hazards in Oxygen Handling Systems* are on:
Mar 17-18, 1997.....St. Louis, MO
Nov 10-11, 1997.....San Diego, CA

Contact Scott Murphy (610) 832-9685 for information or brochure. Cost is $675.00 (including text). Can be offered at your site for a negotiated price.
The two-volume course text: *Fire Hazards in Oxygen Systems* may be ordered from Scott Murphy (610) 832-9685 Price is $195.

The G-4 Videotape *Oxygen Safety* PCN 12-700880-31 may be ordered from ASTM Customer Service at (610) 832-9585. Price $75 ($67 for members).

Recent G-4 Standards actions/revisions:
G 131-96 "Cleaning Materials and Components By Ultrasonic..."
G 136-96 "Ultrasonic Extraction of Contaminants....."
G 93-96 " Cleaning Methods (Revision).....".
G 145-96 "Study of Incidents...."
G 144-96 "Residual Contamination by Total Carbon Analysis..."
G 122-96 "Evaluating Cleaning Effectiveness (Revision)..."

All G-4 standards appear in part 14.02 of the Book of Standards or may be ordered individually from ASTM Customer Service (610) 832-9585. Typical standard prices range $15-30.

Details:

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